

## **Rockfish in San Juan County-Recommendations for Management and Research**

*Tina Wyllie-Echeverria Wyllie-Echeverria Associates,  
Mike Sato, People for Puget Sound*

Keywords: Rockfish, San Juan County, Sebastes, population, management

The San Juan County and its Marine Resources Committee contracted in 2003 with People for Puget Sound to compile the best available science for rockfish species (*Sebastes* spp.) and lingcod (*Ophiodon elongatus*) found in the San Juan Archipelago and to identify management options based on past management history and best available science. The authors compiled background documents of rockfish life histories and their management history in Puget Sound and convened a symposium attended by rockfish and lingcod scientists from local universities, State and Federal agencies, Tribes and local researchers. Based on these documents we present a summary of comments and recommendations. In this paper we focus on rockfish.

### **General Comments:**

Comments that generally apply to the San Juan Archipelago and to the management of the lingcod and rockfish resources in that region were:

- 1) We need to know more about the life history of these species and the factors that affect population growth. Specifically, we need to know where the nursery grounds are, the optimal habitat for all life history stages, and trophic interactions. In addition, we need an assessment of the current populations;
- 2) We need information on the physical oceanography of the region and how convergence zones, thin layers, and the thermocline affects larval survival and distribution as well as climatic conditions such as El Nino/Southern Oscillation and decadal variability; and
- 3) We need to know what is the exposure and contamination from various pollution sources such as feminizing hormones leaching from septic systems and PCBs and agricultural runoff entering surface waters.

The group generally agreed that no artificial stock enhancement should be considered until we understand their genetics, what diseases these species are vulnerable to and species interactions. Since habitat, at this time, does not seem to be a limiting variable to these populations, no artificial habitat should be considered without investigating the natural habitat requirements.

Finally, and most important, a strategy for rockfish and lingcod recovery and sustainability must be developed between and among the co-managers (Washington Department of Fish and Wildlife and treaty Tribal governments), with British Columbia, and with local resource stewards. That strategy should be based on best available science and include goals based on agreed-upon answers to some fundamental questions: Do we want rockfish and lingcod populations to be restored to a level of sustainable harvest? Do we want to base recovery goals on agreed upon historical population levels? To what extent is ecosystem protection part of a recovery strategy? What strategies of catch management and site-based management are best suited to achieve these goals?

### **Species Summaries:**

Nineteen species of rockfish have been observed in the San Juan Archipelago. Species presence and abundance have changed over time. Abundant species today include the copper (*Sebastes caurinus*) and quillback (*S. maliger*), both- rocky reef, bottom-associated species. Also abundant are Puget Sound rockfish or Pugets (*S. emphaeus*), a small species found on rocky reefs or in large mid-water schools. Tiger rockfish (*S. nigrocinctus*) are rarely seen, living solitary lives except during juvenile settlement when they are in the drifts mats of kelp and macroalgae. Along with juvenile tigers are spiltnose (*S. diploproa*) which are only seen in San Juan County as juveniles in the floating kelp mats. Black rockfish (*S. melanops*) used to be abundant about 15 years ago but are rare today. They are an aggregating species, often associated with sub-adult yellowtail rockfish (*S. flavidus*) which also aggregate in mid-water. No adult, mature yellowtails have been reported in the San Juan Archipelago. Widow rockfish (*S. entomelas*) have also been periodically abundant, usually in aggregations on the west side of San Juan Island. Two

deep-dwelling, solitary rockfish are the canary (*S. pinniger*) and yelloweye (*S. ruberrimus*). Canaries and yelloweyes are often fished for in the same habitat at depths greater than 70 meters. Rare species include: brown (*S. auriculatus*), redbanded (*S. babcocki*), silvergrey (*S. brevispinis*), greenstiped (*S. elongates*), vermillion (*S. miniatus*), blue (*S. mystinus*), China (*S. nebulosus*), bocaccio (*S. paucispinis*), and redstripe (*S. proriger*) rockfish. There is no specific information about these rare species beyond the fact that they were observed or caught in San Juan County. No further information will be presented here regarding their life history or status in county waters. The most abundant species have matrices created with the Priorities for Information for each species.

### **Species Matrices:**

Priorities for Information matrices were developed from the discussions and the life history spreadsheets prepared for the symposium. These matrices are designed to show what information is available on the above discussed issues and what information is missing.

**Copper rockfish** are perhaps the best-studied species in the San Juan Archipelago. They live at shallow enough depths to be the subject of SCUBA diver investigations and the underwater video surveys by the WDFW (less than 100 feet). We do not know where the pelagic larva and juveniles reside and hence do not know if they are susceptible to surface pollutants or the specifics of their predators or prey species. Copper populations are increasing and some adults reside within the boundaries of some No-Fishing Reserves. It is not known if the boundaries of the protected sites are large enough to encompass mating aggregations and areas of larval release.

**Quillback rockfish** are similar to coppers in depth distribution and we have considerable information on this species as well. They are solitary, territorial species whose benthic juveniles settle out into high relief rocky reefs and gradually move into deeper water as they grow (40-60 meters as adults). Predators on this species are not specifically known. One study on river otter diets shows small rockfish to be 6% of their diet. The species eaten are not known. We know nothing of the effects of environment or fishing pressure. While this species is also increasing in the San Juan Archipelago, they are not as abundant as copper rockfish and the effects of the No-Fishing Reserves are not as clear.

**Puget Sound rockfish** have increased in abundance in recent years. This species is small and not a target of any fishing effort. Fluctuations in this population may be due to environmental variability or predator/prey interactions. They occur in large aggregations and may be available to predators who feed on schooling herring like Orcas or seals. They also may be vulnerable to toxins due to their shallow and nearshore habitat. This species seems to be an important food for larger rockfish species and lingcod.

**Black rockfish** occur in large aggregations no deeper than 30 meters. Since they are known to move considerable distances, this species may move into the San Juan Archipelago from neighboring habitats (through the Straits of Juan de Fuca and Georgia). No young fish have been seen in the recent past and populations have been greatly reduced in the past 10-15 years. Not much is known about their life history in Puget Sound. Habitats where they have been historically abundant include the area near the Gull Rock and Deadman Bay No-Fishing Reserves. The effects of protected areas are unknown.

**Yellowtail rockfish** are only seen as young, sub-adult fish and their populations have declined in the past 10-15 years. Since no reproductive adults have been seen in the San Juan Archipelago, this species is perhaps evidence of periodic advection of rockfish into this area from the Strait of Georgia or during reverse flow events in the Strait of Juan de Fuca. Not much is known about the population in San Juan County; however, they have been seen in habitats near the Deadman Bay No-Fishing Reserve.

**Widow rockfish** have occasionally been fished in San Juan County and are abundant in large aggregations when present. They have not been reported near any currently protected area.

**Tiger rockfish** is a solitary, territorial species that occurs in low numbers in the San Juan Archipelago. As juveniles they are seen in the drifting kelp mats in San Juan and Upright Channels in the company of juvenile Splitnose Rockfish (adults are not recorded from San Juan County but would live in deep water and not be seen in SCUBA or video surveys.) As adults, tigers occupy crevices in high relief habitat; they may occur at the Bell Island No-Fishing Reserve.

**Canary rockfish** live in deep water over hard and soft substrate. Although they are a residential species in the San Juan Archipelago, they are not known to occur within any marine protected area. Very little is known about this species in San Juan County.

**Yelloweye rockfish** have been the target of sport fishing boats and their current population is low. They live in the same habitat as canary rockfish but also populate high relief pinnacles. They are a large and long-lived species (over 100 years) and are not known to occur in any protected areas in San Juan County.

### **Information Gaps:**

1. Gap: **Basic life history information for rockfishes.** Reproductive seasonality is not known for all the resident rockfishes in San Juan County. Without knowing when or where larvae are released, we cannot know where each species is dispersed. Without knowing predator and prey interactions, we cannot understand the effects of increases or decreases at one level of the food web. We don't know the extent of migration and movement of each species. In order to increase species abundance, data describing their movements into new habitat, larval dispersal and successful benthic juvenile settlement habitat are required. Information of age structure and growth rates are also lacking for most of the rockfish in San Juan County. Strong year classes can be identified from ageing otoliths and related to environmental factors. Growth rates will give an indication as to how long it takes a species to reach reproductive maturity.
2. Gap: **Effects of environment on rockfish and lingcod populations.** Notwithstanding the effects of fishing, rockfish and lingcod are faced with a variety of environmental stressors. These include climate variability, chronic pollution in surface layer (from the atmosphere), episodic pollution from oil spills, and non-point-source pollution from septic seepage and agricultural runoff. Sub-lethal effects could be expressed as reduced reproductive capacity, birth defects, disease, and increased parasites.
3. Gap: **Habitat requirements** (distribution of each life history stage, particularly pelagic larvae and juveniles). An understanding of the physical oceanography and the behavior of plankton around the San Juan Islands are required in order to understand the hazards encountered during their pelagic larvae and juvenile stages. It is generally thought that the year-class strength of rockfish is determined during the transition between the pelagic to benthic juvenile stage. Understanding the habitat needs of the pelagic stage is necessary in evaluating factors affecting these populations.

### **Action items:**

1. Define management goals for San Juan County. These goals must be developed by both State and Tribal co-managers with local participation and will help focus the types of protection necessary in order to achieve the defined goals. To what population levels will depleted stocks be restored: to pre-European settlement levels, pre-fishery levels, to the state of the resources 20-30 years ago? (Even if these goals cannot be established for all species in county waters due to science gaps, it would be important for the co-managers to agree on goals either for some species or for species in some areas of the county.)
2. Fund more effective and efficient enforcement and monitoring of pollution sources and shoreline modifications that affect larval and juvenile life stages. Because these effects are not known, a precautionary approach should be taken, especially in critical nearshore habitats of bays and inlets and areas of seagrasses and kelp beds. Source control and monitoring should be applied to septic system discharges, sewage treatment facilities, storm water discharges, vessel fuel transfers, and vessel waste discharges. Oil spills, large and small, is an ever-present threat and the co-managers and the county should require spill contingency plans and best industry practices from vessels entering and transiting county waters. Shoreline modifications such as docks, floats, and bulkheads should be prohibited if they have a cumulative adverse impact on seagrasses and kelp beds.

3. Investigate the trophic interactions of rockfish and lingcod in San Juan County. This investigation is very difficult, since food webs are multilayered, complex species interactions that need to be delineated to be understood. The effects of reducing forage fish populations due to spawning and rearing habitat loss, harvest, and increased predator populations as a result of species protection or recovery needs to be understood if targeted species of rockfish will recover in San Juan County. For example, seals compete with lingcod and rockfish for herring, and lingcod eat rockfish. A bioenergetics model should be developed to establish what the predator/prey relationships are and what level of natural predation pressure the rockfish and lingcod populations are under. By doing so, state and tribal co-managers and the county will have a better idea of how much environment versus human interaction determine the levels of rockfish and lingcod populations.
4. Fund more effective and efficient enforcement and monitoring to determine how much fishing is done in regulated and non-regulated areas, to determine catch size, age and location, and to minimize incidental take. The current impact of targeted rockfish and lingcod fishing appears low and the county should support sport regulations that close county waters to spear fishing of rockfish and establishing a season for fishing for rockfish. State and tribal co-managers should adopt sport gear restrictions to reduce incidental catch in salmon fishing areas inhabited by rockfish. One benefit of more effective and efficient enforcement is better monitoring of catch data. Some of this monitoring should be done on the water and dockside at a low cost by local residents. Information on reproductive season, age/growth, and prey can be collected from rockfish carcasses if the fishermen or dockside fisheries technicians can collect and freeze them. A county location should be established for storing and processing these samples.
5. Identify and establish recovery areas with management plans for all resident species of rockfish in San Juan County waters. The most common species include black, tiger, yelloweye, Puget Sound, copper and quillback rockfish. These rockfish occupy four habitat types: rocky reef, kelp forest, and mid-water and deep-water rocky reefs (deeper than 100 feet). Currently, lingcod, Puget Sound, copper and quillback habitat is represented in the regulated No-Fishing reserves. State and tribal co-managers and the county should work with the U. S. Fish and Wildlife Service to determine which of the 200-yard no-boating zones around their 83 San Juan National Wildlife Refuges contain rockfish habitat, especially for yelloweye, tiger, and black rockfishes. These additional recovery zones would add protection to rockfish resources, particularly those whose habitat does not currently exist in San Juan County regulated No-Fishing reserves.

A complete summary of the symposium, the participant list, literature search, management history, species matrices, and interview results is available on CD from the San Juan County Marine Resources Committee: [jody@sjcmrc.org](mailto:jody@sjcmrc.org).